Ontario Geological Survey

Report 229

Geology of the

Rotunda Lake-Percy Lake Area

Districts of Algoma and Sudbury

by

B.C. Wilson

1983

Ontario

Ministry of Natural Resources

Hon Alan W Pope
Minister

W T Foster
Deputy Minister

© OMNR-OGS 1983
Printed in Canada

ISSN 0704-2582
ISBN 0-7743-8085-3

Publications of the Ontario Ministry of Natural Resources are available from the following sources. Orders for publications should be accompanied by cheque or money order payable to the *Treasurer of Ontario*.

Reports, maps, and price lists (personal shopping or mail order):
Public Service Centre, Ministry of Natural Resources
Room 1640, Whitney Block, Queen's Park
Toronto, Ontario M7A 1W3

Reports and accompanying maps (personal shopping):
Ontario Government Bookstore
Main Floor, 880 Bay Street
Toronto, Ontario

Reports and accompanying maps (mail order or telephone orders):
Publications Services Section, Ministry of Government Services
5th Floor, 880 Bay Street
Toronto, Ontario M7A 1N8
Telephone (local calls), 965-6015
Toll-free long distance, 1-800-268-7540
Toll-free from Area Code 807, 0-ZENITH-67200

Every possible effort is made to ensure the accuracy of the information contained in this report, but the Ministry of Natural Resources does not assume any liability for errors that may occur. Source references are included in the report and users may wish to verify critical information.

Parts of this publication may be quoted if credit is given. It is recommended that reference to this report be made in the following form:

Wilson, B.C.
1983: Geology of the Percy Lake-Rotunda Lake Areas, Districts of Algoma and Sudbury; Ontario Geological Survey Report 229, 32p. Accompanied by Map 2490, scale 1:31 680 or 1 inch to ½ mile.

Critical Reader: V.G. Milne
Scientific Editor: Guy Kendrick

1000-300-82-Thorn

The number for the map accompanying this report has been changed from Map 2490 to Map 2478.

FOREWORD

ROTUNDA LAKE - PERCY LAKE AREA

The Precambrian volcanic and sedimentary rocks extending northeast from Batachawana are significant for the development of the Sault Ste. Marie area. These rocks have the potential for containing native copper, and copper sulphide minerals, lead, zinc, and precious metal deposits. No extensive mineral exploration has been done in the map area because of access difficulty, land status, and a geological data base which was inadequate for mineral potential assessment. Since 1974, a series of projects, which resulted in detailed geological bedrock mapping of about 1550 km^2 in the western two thirds of this belt, have been completed. This report and map present the findings of a 1979 survey of the northeastern extremity of the belt.

A good geological data base is essential for effective mineral exploration, land use, and resource development planning.

E.G. Pye
Director
Ontario Geological Survey

CONTENTS

PAGE

Abstract ... ix

Introduction ... 1
- Location and Access ... 1
- Physiography ... 1
- Field Mapping Procedure ... 2
- Previous Geological Mapping ... 3
- Mineral Exploration ... 3
- Acknowledgments ... 3

General Geology ... 4
- Early Precambrian (Archean) ... 4
  - Metavolcanics and Metasediments ... 6
    - Mafic to Intermediate Metavolcanics ... 6
      - Mafic Flows, Tuffs, Metasediments ... 9
      - Pillowed Mafic Flows ... 10
      - Bedded Mafic Tuffs ... 10
      - Mafic to Intermediate Tuffs, Metasediments ... 11
    - Felsic Metavolcanics ... 12
      - Felsic Tuff, Crystal Tuff, Metasediments ... 12
    - Clastic Metasediments ... 12
      - Wacke, Mudstone, Sandstone ... 13
      - Conglomerate ... 13
    - Chemical Metasediments ... 13
      - Magnetite Ironstone, Chert ... 15
  - Felsic to Intermediate Intrusive and Metamorphic Rocks ... 15
    - Feldspar Porphyry, Quartz-Feldspar Porphyry ... 16
    - Gneissose to Metatexitic Quartz-Feldspar Rocks ... 16
    - Quartz-Feldspar Intrusive Rocks ... 16
- Middle to Late Precambrian (Proterozoic) ... 17
  - Mafic Intrusive Rocks ... 18
    - Diabase, Porphyritic Diabase, Olivine Diabase ... 18
  - Clastic Dike ... 18
- Cenozoic ... 19
  - Quaternary ... 19
    - Pleistocene and Recent ... 19

Structural Geology ... 19

Synthesis and Geological History ... 20

Economic Geology ... 21
- Summary of Occurrences ... 23
  - Description of Properties and Occurrences ... 23
    - Algoma Central Railways (1962) (1) ... 24
    - Algoma Ore Properties Limited (1965) (2) ... 24
    - Asarco Exploration Company of Canada Limited (1974) (3) ... 25
    - Golden Ashley Explorations Limited (1966) (4) ... 26
    - Kerr Addison Gold Mines Limited (1959) (5) ... 26
    - Rio Canadian Exploration Limited (1956) (6) ... 27
    - Rochefort Mining Syndicate (1930) (7) ... 27
    - Sutherland Occurrence (8) ... 27
- Suggestions for Further Exploration ... 27

References ... 28

Index ... 29

TABLES

1–Table of Lithologic Units 5

2–Chemical analyses and molecular norms 7

FIGURES

1–Key map showing location of Rotunda Lake - Percy Lake Area viii

2a–Jensen Cation Plot 8

2b–AFM Plot 9

PHOTOGRAPHS

1–Pillowed mafic flow with large feldspar phenocrysts 11

2– Sphene in the fine-grained matrix of a granule conglomerate 14

3–Sphene in a lithic clast from a granule conglomerate 15

GEOLOGICAL MAP

(back pocket)

Map 2478 (coloured)—Rotunda Lake-Percy Lake, Districts of Algoma and Sudbury
Scale 1:31 680 or 1 inch to ½ mile

Figure 1–Key map of the Rotunda Lake-Percy Lake Area
Scale 1 3 168 000

ABSTRACT

The Rotunda Lake-Percy Lake map area is dominated by a metavolcanic-metasedimentary complex. This complex is bordered to the north and southeast by granitic intrusive and metamorphic rocks and is intruded by felsic to intermediate and mafic dikes, sills, and a small stock. Metavolcanics at the western edge of the complex comprise mostly mafic flows, but those at the east end are mostly mafic to intermediate clastic rocks. The mafic to intermediate metavolcanics are transitional to, and are interbedded with, metasediments. Minor amounts of felsic metavolcanics and chemical metasediments are also interbedded with the mafic to intermediate metavolcanics. The most extensive area of felsic metavolcanics occurs adjacent to the western boundary of the area. Felsic tuffs and granule conglomerates are calc-alkalic rhyolites and dacites. The mafic to intermediate metavolcanics are high-magnesium and high-iron tholeiitic basalt, tholeiitic dacite, and calc-alkalic basalt. The volcanic source was probably located outside the map area to the west. The presence of sphene-bearing clasts in conglomerates suggests that metasediments were derived, in part, from plutonic rocks.

Intruding the complex close to its outer edges, are tonalitic to granodioritic dikes and sills. A quartz diorite to tonalite stock intrudes the complex southeast of Troy Lake, and tonalite borders the complex to the southeast. Gneissose rocks, possibly metasediments, border, and may be interbedded with, metavolcanics and metasediments to the north. Felsic to intermediate feldspar porphyry, and quartz-feldspar porphyry sub-volcanic dikes and sills and younger diabase and olivine diabase dikes and sills are common.

The supracrustal rocks have been altered by low-grade metamorphism. Chlorite is the dominant mafic mineral, but amphiboles and garnet are present close to the outer edges of the complex.

The metavolcanic and metasedimentary rocks were folded about a synclinal axis and an anticlinal axis.

Geology of the Rotunda Lake-Percy Lake Area, Districts of Algoma and Sudbury, by B.C. Wilson, Ontario Geological Survey Report 229, 32p. Published 1983. ISBN-0-7743-8085-3.

CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
		LENGTH			
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
		AREA			
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
		VOLUME			
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
		CAPACITY			
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
		MASS			
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
		CONCENTRATION			
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE–Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in co-operation with the Coal Association of Canada.

Geology
of the
Rotunda Lake-Percy Lake Area
Algoma and Sudbury Districts

by

B.C. Wilson[1]

INTRODUCTION

LOCATION AND ACCESS

The Rotunda Lake-Percy Lake area is centred about 100 km north-northeast of Sault Ste. Marie, Ontario, and is located in the Districts of Algoma and Sudbury. The map area lies south of the junction of the Cow and Montreal Rivers. At this point, these rivers form a reservoir. This is contained by a power dam located on the Montreal River 40 km southwest of the map area. The area mapped is bounded to the north by Latitude 47°22′30″N and to the west by Longitude 84°05′00″W. The mapping was extended; southwest to Latitude 47°15′N, to the southeast just beyond the contact with the granitic rocks, and to the east to a line about 2 km northeast of and parallel to an Ontario Hydro power line. The map area includes parts of Scriven, Moggy, Schembri, Moen, Running, and McParland Townships (formerly Township 22, Ranges 15 and 16, Township 23, Ranges 15 and 16, and Township 24, Ranges 15 and 16 respectively).

The map area is accessible by air, water, or road. Float-equipped aircraft are available at numerous locations, notably Sault Ste. Marie, Wawa, Chapleau, and Batchawana Bay. The reservoir contains thousands of floating logs

---

[1]Geologist, Precambrian Geology Section, Ontario Geological Survey, Toronto.

Manuscript approved for publication by Chief Geologist, Ontario Geological Survey, Toronto, July 28, 1980.

This report is published with the permission of E.G. Pye, Director, Ontario Geological Survey, Toronto.

and submerged stumps which make landings difficult. The water level drops by about 4.5 m during the field season. The logs are more confined to the shore as the water level falls and become less of a problem to navigation. Apart from the reservoir, Caesar, Percy, and Pan Lakes are accessible by float-equipped aircraft. Helicopter service is available from Sault Ste. Marie and Timmins. Many landing sites exist throughout the map area for helicopters; most occur beside the abundant small and often partly drained lakes.

From Chapleau, the Sheppard and Morse road extends 100 km to the edge of the Cow River in Moen Township. Improvements made to the road were completed during the summer of 1979 have made it suitable for ½ ton two-wheel drive vehicles except in the early spring. The Sheppard and Morse road provides access to the Ontario Hydro Line road which crosses through the map area. The reservoir may also be reached at its western end by way of a private road beginning near Montreal River Harbour on Lake Superior.

Travel by boat on the reservoir is commonly hampered by log jams. This is especially the case early in the field season. Landing sites for boats, including the one at the Sheppard and Morse road, are jammed by logs and are then inaccessible. Prevailing southwest winds concentrate logs east of the narrows at the Sheppard and Morse road, making boat travel there difficult or impossible throughout much of the field season. Other rivers within the map area are not recommended for boat travel due to a large number of rapids and waterfalls.

PHYSIOGRAPHY

Bedrock outcrops are abundant in the Rotunda Lake-Percy Lake area; but the majority of the exposures are moss and tree covered, and show only low vertical faces. A few scattered outcrops, especially those beside partly drained lakes, have good exposures and allow detailed studies of the surface textures of the rocks to be made. An excellent cross-section of rock types occurs along the Ontario Hydro power line and the power line road.

The map area has been deeply incised by a considerable number of rivers and creeks. The lowest elevation within the map area, 335 m (Department of Energy, Mines and Resources 1976, 1977) above m.s.l., is at the junction of the Batchewana River and Alder Creek in the southwest corner of the map area. Hills close to Lake A (Pillow Lake) and Lake B (Lizard Lake) rise 549 m above m.s.l. for a total topographic relief for the map area of 214 m. Local relief varies from a few tens of metres around Rotunda Lake to as much as 152 m on the north shore of the Montreal River.

Except for low, relatively flat areas around Rotunda Lake and southwest of Caesar Lake, the map area is well drained and dry. All of the rivers and creeks in this area flow into the Montreal or Batchawana Rivers which in turn empty southwestward into Lake Superior. Swamps and peat-flats surround many of the lakes, rivers, and creeks; however, because of low water levels during the 1979 field season, much of this ground was dry.

FIELD MAPPING PROCEDURE

Geological mapping was carried out during the 1979 field season at a scale of 1:15 840 for reproduction at a scale of 1:31 680 (*see* Map 2490, back pocket). Geological data were plotted on acetate overlays on air photographs supplied by the Division of Forests, Ontario Ministry of Natural Resources at a scale of 1:15 840. The base map was prepared at the same scale as the air photographs by the Cartography Section, Division of Lands, Ontario Ministry of Natural Resources from map-sheets of the Forest Resources Inventory of the Division of Forests. Traverses were made by the pace-and-compass method to visit bedrock outcrops previously examined by using aerial photographs. Many exposures were undoubtedly missed because: most of the outcrops are not apparent from such an examination; and, the time available did not permit all the exposures to be examined.

Geological data kept in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie, and the offices of the Algoma Central Railway, Sault Ste. Marie, were used to a limited extent in the mapping and interpretation of the map area.

PREVIOUS GEOLOGICAL MAPPING

The map area was first mapped by N.B. Keevil (1936). Boundaries plotted between the metavolcanic and plutonic rocks by Keevil (1936) were used by R.E. Giblin and E.J. Leahy (1977) in their compilation of the Batchewana Sheet. E.S. Moore (1925) mapped most of the southern part of the current map area. The maps accompanying the reports of Moore (1925) and by Keevil (1936) were out of print in 1982.

The Rotunda Lake-Percy Lake map area is also covered by topographic (Department of Energy, Mines, and Resources, 1976, 1977), aeromagnetic (Ontario Department of Mines - Geological Survey of Canada 1963a, 1963b) and engineering and terrain maps (McQuay 1979; Roed and Hallett 1979). E.C. Grunsky (1979a) and G.M. Siragusa (1978) have recently mapped the areas to the west and south of the current map area.

MINERAL EXPLORATION

Records of exploration activity in the area are kept in the Assessment Files Research Library, Ontario Geological Survey, Toronto, and in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie, and in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Timmins. Running and McParland Townships are owned by and the exploration and staking activity in these townships are controlled by, the Algoma Central Railway (ACR). Data on these townships may be found in the ACR offices in Sault Ste. Marie.

Sporadic staking activity has occurred in this area since 1924. The earliest

reported exploration was undertaken by the Rochefort Mining Syndicate. This company investigated a sizeable quartz vein near Quinn River in Running Township in 1926. This occurrence was mapped and drilled by Kerr Addison Gold Mines Limited in 1959. Later prospecting in Running Township included the following:

1. geological, airborne electromagnetic, ground gravity, and magnetic and silt and soil geochemical surveys undertaken by Rio Canadian Exploration Limited (formerly Technical Mine Consultants) in 1956
2. brief geological surveys conducted by ACR in 1960 and 1962
3. a geological survey conducted by Golden Ashley Explorations Limited in 1966

Work in McParland Township consisted of two brief geological surveys by ACR in 1961 and 1962. No work has been reported in Scriven Township.

Schembri, Moen, and Moggy Townships were explored between 1955 and 1974. A program of the Algoma Ore Properties Limited included airborne magnetic, ground electromagnetic, ground magnetic, geological, and water geochemical surveys, and, just south of Lake B (Lizard Lake), diamond drilling. In 1965, Sutherland and Associates diamond drilled 13 holes near Lake A (Pillow Lake) in Schembri Township.

Following an airborne magnetic and electromagnetic survey in 1973, Asarco Exploration Company of Canada Limited diamond drilled four holes in Moen, Schembri, and Moggy Townships.

As of December 1979 only two claims, both leased by Algoma Steel Corporation Limited, were in good standing within the map area. No exploration activity was noted by the author during the summer of 1979.

ACKNOWLEDGMENTS

The author was ably assisted in the field by Heather Oiye, senior assistant, and by Janice Lavergne, Marc MacLeod and David Saunders, junior assistants. Geological data were supplied by D. Hunt and E.J. Leahy of the Resident Geologist's Offices in Timmins and Sault Ste. Marie, respectively, and by N. Ingram, the mining recorder for the Algoma Central Railway in Sault Ste. Marie. Special thanks are due Dr. D.R. Pyke, Ontario Geological Survey, for his discussions and encouragement during all stages of the mapping project.

GENERAL GEOLOGY

Rocks of volcanic origin within the Rotunda Lake-Percy Lake map area are part of the Batchawana Greenstone Belt (Giblin and Leahy 1977). Within the map area, the stratigraphy is characterized by a sequence of steeply dipping, metamorphosed rocks dominantly volcanic in origin and composed of interbedded layers of flows, tuffs, and associated metasediments. These rocks, with a source thought by the author to exist west of the map area, formed a volcanic edifice which was deposited, and then deformed to form what is herein termed a metavolcanic-metasedimentary complex.

TABLE 1 | TABLE OF LITHOLOGIC UNITS FOR THE ROTUNDA LAKE - PERCY LAKE AREA.

PHANEROZOIC

CENOZOIC

QUATERNARY

PLEISTOCENE AND RECENT

Till, gravel, sand, silt, clay (minor fluvial, lacustrine and swamp deposits of gravel, sand, silt, clay).

Unconformity

PRECAMBRIAN

MIDDLE TO LATE PRECAMBRIAN (PROTEROZOIC)

MAFIC INTRUSIVE ROCKS

Diabase, porphyritic diabase; olivine diabase.

Intrusive Contact

EARLY PRECAMBRIAN (ARCHEAN)

FELSIC TO INTERMEDIATE INTRUSIVE AND METAMORPHIC ROCKS

Feldspar porphyry, quartz-feldspar porphyry; gneissose to metatexitic quartz-feldspar rocks; quartz-feldspar intrusive rocks.

Intrusive Contact[a]

METAVOLCANICS AND METASEDIMENTS

CHEMICAL METASEDIMENTS

Magnetite ironstone; chert.

CLASTIC METASEDIMENTS

Wacke, mudstone, sandstone, conglomerate.

FELSIC METAVOLCANICS

Tuffs, crystal tuffs, metasediments.

MAFIC TO INTERMEDIATE METAVOLCANICS

Mafic flows, tuffs, metasediments; pillowed mafic flows; bedded mafic tuffs; mafic to intermediate tuffs and metasediments.

Note: [a] The gneissose to metatexitic rocks may be conformable with the metavolcanics and metasediments.

Within the map area, the metavolcanics show a facies change from rocks that are dominantly flows in the west to rocks that are dominantly clastic in the east. Interbedded with the metavolcanics are clastic and chemical metasediments, the latter metasedimentary rock consists mainly of magnetite ironstone and chert. Clastic rocks exposed near the base of the complex contain lithic clasts which are plutonic in origin, and were possibly derived from a source to the north of the map area.

Rock-types found within the Rotunda Lake-Percy Lake area are shown in Table 1. A simplified stratigraphic section interpreted by the author for the metavolcanic-metasedimentary complex is as follows:

1. at the base, interbedded mafic to intermediate flows, tuffs and conglomerate, followed by
2. dominantly mafic to intermediate flows, pillowed flows and tuffs interbedded with minor felsic tuff and crystal-tuff and chemical metasediments, followed by
3. mafic to intermediate flows and a higher proportion of tuffs, and finally
4. in the western part of the map area only, felsic tuff and crystal tuff

These rocks are bordered to the north by gneissose to metatexitic felsic to intermediate metamorphic rocks and to the southeast by felsic to intermediate intrusive rocks. The metavolcanics and metasediments are cut by:

1. a small felsic to intermediate quartz diorite to tonalite stock southeast of Troy Lake (the Troy Lake Stock)
2. felsic to intermediate tonalitic to granodioritic dikes and sills close to the edges of the complex
3. rhyolitic, probably sub-volcanic dikes and sills that are widespread

Chemical analyses of a limited number of specimens are listed in Table 2. These analyses are plotted on Figures 2a and 2b, and show the mafic to intermediate metavolcanics to be probably composed of; high-magnesium and high-iron tholeiitic basalt, calc-alkalic basalt, and tholeiitic dacite. Felsic tuffs and granule conglomerates plot as calc-alkalic rhyolite and dacite.

Mineral parageneses found within the map area indicate relatively low temperature low grade metamorphism (Winkler 1976) affected the central part of the metavolcanic-metasedimentary complex. The complex was affected by higher temperature low grade metamorphism close to its edges.

Rocks found within the complex appear to be interbedded with the gneissose rocks along the northern border and to be folded about a synclinal and an anticlinal axis. This anticlinal axis not shown on the map-face. Evidence for faults with offsets of more than a few centimetres was not observed.

Aeromagnetic maps (Ontario Department of Mines - Geological Survey of Canada 1963a, 1963b) show magnetic highs south of Lake B (Lizard Lake) and at the western border of the map area in McParland Township. The high at Lake B is probably a result of the presence of magnetite ironstone. Although no outcrops of ironstone were observed within the map area in McParland Township, the magnetic high there is probably also due to the presence of ironstone (Grunsky 1979a). Other patterns of magnetic ocurrences are not obvious on the aeromagnetic maps.

Early Precambrian (Archean)

METAVOLCANICS AND METASEDIMENTS

Rock-types are intermixed in the map area to such a degree that contacts between narrow units within small outcrops were omitted. This is mainly due

TABLE 2 | CHEMICAL ANALYSES AND MOLECULAR NORMS OF ROCKS FROM THE ROTUNDA LAKE-PERCY LAKE MAP-AREA, CHEMICAL ANALYSES BY MINERAL RESEARCH BRANCH, ONTARIO GEOLOGICAL SURVEY.

Sample Number	2	40	48	54	89	157	205	212	230	254	255	277
	MAJOR COMPONENTS IN WEIGHT PERCENT											
SiO_2	66.40	57.90	66.80	68.70	49.10	48.40	48.90	67.70	80.80	50.70	61.70	50.30
TiO_2	0.45	1.66	0.52	0.33	1.45	1.04	0.88	0.53	0.26	0.86	1.45	1.00
Al_2O_3	17.00	14.50	16.30	16.20	17.40	16.20	14.70	18.20	10.20	14.80	15.00	13.70
Fe_2O_3	2.76	10.20	3.84	2.57	10.80	13.20	11.60	2.96	1.84	11.50	8.32	12.50
FeO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MnO	0.04	0.13	0.07	0.05	0.27	0.20	0.19	0.06	0.05	0.20	0.21	0.21
MgO	1.32	4.14	1.51	1.32	6.00	6.75	7.89	1.34	0.56	5.96	2.12	7.51
CaO	3.08	3.89	3.74	2.14	6.02	9.04	10.20	3.01	1.71	10.90	3.71	9.04
Na_2O	6.25	4.07	5.31	7.06	4.63	2.42	1.93	1.73	2.64	2.82	3.71	3.45
K_2O	1.91	0.28	1.03	0.48	0.57	0.57	0.52	2.80	0.99	0.06	0.78	0.56
P_2O_5	0.14	0.29	0.21	0.16	0.14	0.11	0.12	0.18	0.10	0.10	0.15	0.10
CO_2	0.39	1.45	0.71	0.65	0.77	1.66	0.93	0.57	0.42	1.28	1.02	0.58
S	0.03	0.05	0.02	0.02	0.04	0.04	0.03	0.02	0.02	0.11	0.07	0.03
H_2O+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H_2O-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	99.77	98.56	100.06	99.68	97.19	99.63	97.89	99.10	99.59	99.29	98.24	98.98

EXPLANATION

Sample Number	Remarks
2	Felsic to intermediate feldspar porphyry; 2 km southeast of map-area on Ontario Hydro power line road, Scriven Township.
40	Mafic to intermediate tuff; near "Quinn River," Running Township.
48	Granule conglomerate; on Ontario Hydro power line road just north of Toll Creek, Moggy Township.
54	Felsic to intermediate feldspar porphyry; on Ontario Hydro power line road 0.5 km northwest of Percy Lake, Moggy Township.
89	Mafic to intermediate tuff; 1 km S20° W of Sheppard and Morse Road, Moen Township.
157	Mafic tuff; 2 km N70°W of Rotunda Lake, McParland Township.
205	Mafic to intermediate tuff; 2 km N15°E of junction of Batchawana River and Alder Creek, Running Township.
212	Granule conglomerate; 1.5 km N5°E of junction of westernmost creek joining Batchawana River in map-area, Running Township.
230	Felsic tuff; 1.75 km N5°W of westernmost creek joining Batchawana River in map-area, Running Township.
254	Pillowed mafic flow (medium green); on Batchawana River 1 km northeast of Vacher Creek, Running Township.
255	Pillowed mafic flow (dark green); 2 km S30°W of Rotunda Lake, Running Township.
277	Mafic flow, tuff; 1.5 km S65°W of Lake "A" (Pillow Lake), Schembri Township.

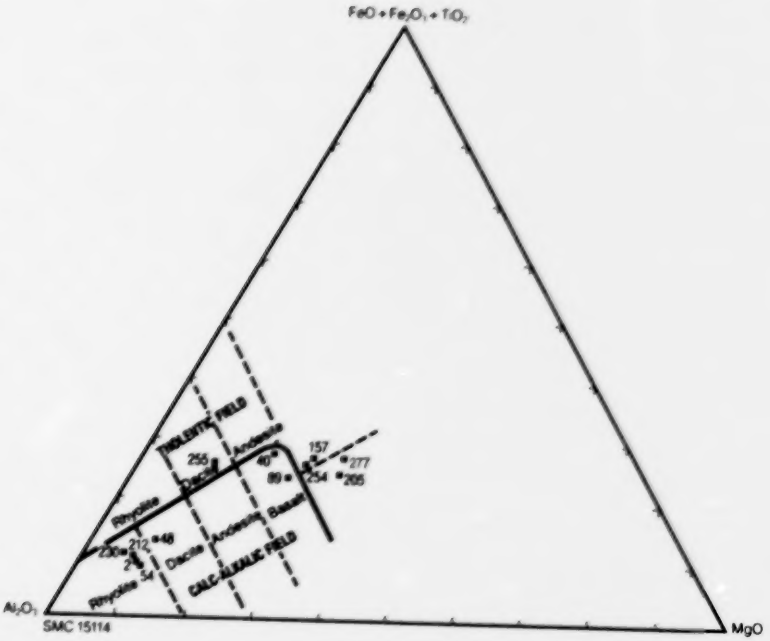


Figure 2a–Jensen Cation Plot of rocks from the Rotunda Lake-Percy Lake map area. *See* Table 2 for rock names and Map 2490, in back pocket, for sample locations.

to the scale selected for mapping. The delineation of contacts is further complicated by problems arising from the mapping of metavolcanics by their colour index. A consistent and accurate separation of mafic, intermediate, and felsic components is hindered by such variables as metamorphic grade, degree of deformation or weathering, and the variable content of light-coloured mafic minerals.

These rocks have a most important aspect. This is that the rocks are not exposed as a number of distinct and easily defined rock units. Many of the units plotted on the map have been necessarily generalized. This is the case with the clastic metavolcanics and metasediments.

Clastic metavolcanics, comprising mafic, intermediate to mafic and felsic tuff and crystal tuff are transitional to metasediments which comprise wacke, mudstone, sandstone, and conglomerate. Clastic metavolcanics and metasediments appear to be transitional to, and interbedded with the gneissose rocks along the northern edge of the map area. Feldspar crystal-bearing mafic to intermediate tuffs and metasediments are transitional in colour and texture to the feldspar porphyry and the felsic crystal tuffs.

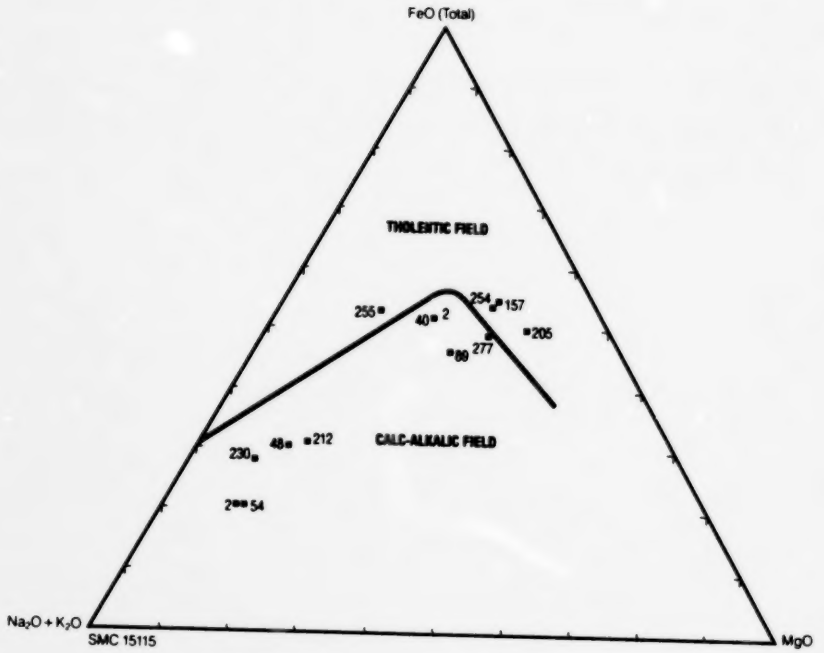


Figure 2b–AFM Plot of rocks from the Rotunda Lake-Percy Lake map area. *See* Table 2 for rock names and Map 2490, in back pocket, for sample locations.

Mafic to Intermediate Metavolcanics

Rocks in the Rotunda Lake-Percy Lake area mapped as mafic to intermediate metavolcanics, comprise massive and pillowed flows, tuffs, and metasediments. These rocks have been subdivided in the legend on Map 2490, back pocket, on the basis of their primary structures and colour index. Results of chemical analyses of 7 samples (Figures 2a and 2b and Table 2) show these rocks to be high-magnesium and high-iron tholeiitic basalt, tholeiitic dacite and calc-alkalic basalt. Examination of thin sections of dacite revealed a dark green rock that contains a high proportion of plagioclase phenocrysts. The rock is possibly a cumulate, and this would account for the shift in trend towards an enrichment in alumina.

Minerals of metamorphic origin present in the mafic to intermediate metavolcanics include mostly chlorite and amphibole. Hornblende is common close to the outer edge of the metavolcanic-metasedimentary complex; however, examination of most thin sections reveals that it is partly retrograded to chlorite. Long acicular needles of amphibole, possibly actinolite, were found to be common right across the complex close to the western edge of the map area. Chlorite is the dominant mafic mineral throughout the central part of the map area.

Feldspar crystals are partly or occasionally completely altered to saussurite, a mixture of sodic plagioclase, epidote, carbonate, and sericite. Where original textures can be recognized, the feldspar crystals are frequently twinned. Alteration of the feldspars has prevented the accurate determination of the anorthite content.

MAFIC FLOWS, TUFFS, METASEDIMENTS

The massive, fine- and medium-grained, mafic flows, tuffs and metasediments consist of rocks which show no primary structures. Although it was impossible to distinguish in the field between fine-grained mafic flows and clastics, the medium-grained mafic rocks appear to be mostly flows and are not commonly clastics. Flow boundaries were not commonly observed. This suggests that the flows may be thicker than the width of individual outcrops which is often a distance of ten metres or more. A few outcrops contained flows from 0.5 to 2 m in thickness. Occasional cross-cutting relationships indicate that the flows are in part intrusive into older metavolcanics and metasediments. Fresh surfaces of the massive mafic rocks are dark green to grey-green with coarser grained specimens being somewhat mottled a medium and dark green. Weathered surfaces are dark green to black. Thin section examination shows these rocks to be composed dominantly of plagioclase and a mafic mineral, either chlorite or an amphibole, and minor epidote and opaque minerals. Mafic content averages around 50 percent. Amphibole crystals, mostly hornblende, are generally rimmed or replaced by chlorite. Plagioclase crystals are partly to completely saussuritized.

PILLOWED MAFIC FLOWS

Pillowed mafic flows are common throughout the map area, especially south of the synclinal axis. Exposures are best along the Batchewana River where river erosion has resulted in large, well exposed areas of bedrock. Pillows there seem to be relatively undeformed; pillow shape and packing provide abundant top determinations.

North of Lake A (local name Pillow Lake), some pillows measure 1 m by 3 m, but elsewhere these pillows are, more commonly, on average 0.3 m by 0.5 m in size. On the southern shore of the same lake, pillows contain feldspar phenocrysts that are as much as 10 cm by 15 cm in size (Photo 1). Fresh specimens of pillow cores are medium to dark green, have dark green to black selvages, and occasionally have light to medium green rim-type varioles close to the selvage. Weathered surfaces are dark green to black and selvages can be very difficult to see with the naked eye. Two thin sections show pillow cores to be composed dominantly of plagioclase and a mafic mineral, either chlorite or amphibole, and minor epidote and opaque minerals. Amphibole crystals, mostly hornblende, are generally rimmed or replaced by chlorite. Plagioclase crystals are partly to completely replaced by saussurite. The mafic content of these rocks appears to average about 50 percent.

OGS 10 553

Photo 1–Pillowed mafic flow with feldspar phenocrysts,found on the south shore of Lake "A" (Pillow Lake).

BEDDED MAFIC TUFFS

Most of the bedded mafic tuffs and metasediments were found to be exposed along the Montreal and Cow Rivers close to the contact with the gneissose rocks. These mafic clastics are thinly laminated (0.3 m thick) to thick bedded (3 m thick) and are commonly interbedded on every scale with other metavolcanics and metasediments. Fresh surfaces are dark green to grey-green and weathered surfaces are dark green to black. Five thin sections show the mineralogy of these rocks to be dominantly plagioclase and a mafic mineral, either chlorite or amphibole, with minor epidote, opaque minerals and occasionally garnet. The mafic content of these rocks are highly variable, and ranges from 30 percent to 75 percent in individual layers. Amphibole is altered to chlorite and plagioclase crystals are altered to saussurite.

MAFIC TO INTERMEDIATE TUFFS, METASEDIMENTS

The mafic to intermediate tuffs and metasediments comprise a wide variety of massive or thinly laminated to thick bedded rocks interbedded on every scale with other types of metavolcanics and metasediments. This grouping of metavolcanics was separated from the mafic metavolcanics described above on the basis of a lower colour index. These rocks are most abundant close to the outer edges of the metavolcanic-metasedimentary complex and close to the synclinal axis shown on Map 2490, back pocket. The number of outcrops of mafic to intermediate metavolcanics increases dramatically towards the eastern end of the map area. Colours of fresh hand specimens range from medium to dark green, grey, grey-green, grey-brown, brown-green, and not commonly pink-green. Weathered surfaces are medium to dark green, grey, brown, and pink. Individual outcrops display considerable colour and textural variations interbedded on every scale. Thin sections contain; altered plagioclase, a mafic mineral, either chlorite or an altered amphibole; and minor epidote and opaque minerals. Many specimens contain in addition to these minerals, biotite, sphene, leucoxene and relatively large clasts of feldspar crystals and of quartz. Large feldspar crystal clasts are most abundant close to the outer edges of the complex, composing in places as much as 20 percent of the total rock volume. These clasts are common right across the belt east of Troy Lake. Mafic to intermediate metavolcanics have similar colour index to some of the pillowed mafic flows; however thin sections of mafic to intermediate metavolcanics reveal that these rocks appear to contain a smaller percentage of mafic minerals than the mafic metavolcanics.

Felsic Metavolcanics

A relatively small volume of felsic metavolcanics consisting of tuffs, crystal tuffs, and metasediments was found within the map area. Most of these rocks are interbedded with other metavolcanics and metasediments at the western edge of Running Township. These rocks were distinguished from the mafic to intermediate tuffs on the basis of colour index. The felsic metavolcanics contain little or no mafic minerals and an analysis of a single sample shows it to be a calc-alkalic rhyolite (Figures 2a and 2b and Table 2).

FELSIC TUFF, CRYSTAL TUFF, METASEDIMENTS

Outcrops of felsic tuffs, crystal tuffs, and metasediments are occasionally massive, but are usually thinly laminated (0.3 cm) to thickly bedded (30 to 100 cm). Fresh surfaces are light to medium green, grey, buff, and brown, and weathered surfaces are light to medium grey and brown. Individual outcrops display considerable colour and textural variations on all scales. Thin section examination reveals the presence of plagioclase with lesser quartz, muscovite, chlorite, biotite, and epidote and uncommon tourmaline and opaque minerals.

Feldspar crystal clasts and occasionally quartz clasts are present in a number of specimens. Feldspar crystals are generally saussuritized.

Clastic Metasediments

Clastic metasediments are interbedded with the metavolcanics throughout the map area. These metasediments include up to a few metres thickness of thinly laminated to thickly bedded wacke, mudstone, sandstone, and conglomerate. The wacke, mudstone, and sandstone have been distinguished in the field from the metavolcanics using the following criteria: such rocks are more granular and micaceous in appearance; have a tendency to be grey or brown; and are commonly stained by iron oxide. Analyses of two samples of granule conglomerate, both containing plagioclase-quartz lithic clasts, show them to have bulk compositions which plot as calc-alkalic rhyolite and dacite (Figures 2a and 2b and Table 2).

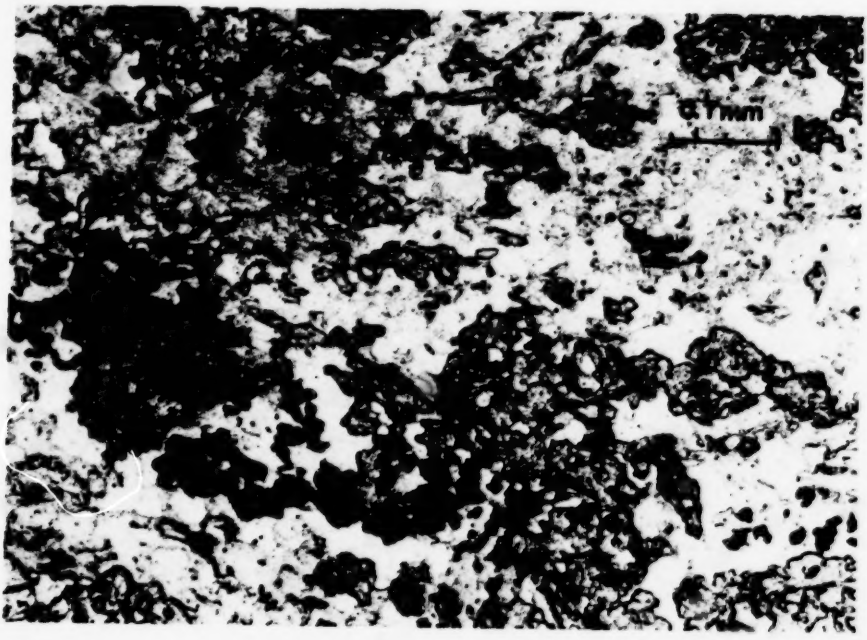
Very minor amounts of garnet were found close to the northern, western, and southeastern boundaries of the map area in pelitic (aluminous) sedimentary rocks associated with amphibole-bearing metavolcanics.

WACKE, MUDSTONE, SANDSTONE

Thin, discontinuous beds of wacke, mudstone, and sandstone are common throughout the map area. These rocks, except in a few locations close to the northern edge of the metavolcanic-metasedimentary complex, have not been differentiated and mapped separately from the mafic and mafic to intermediate tuffs. This is because of the transitional nature of these rock-types. A few samples of the metasediments were biotite rich, and on that basis, are easily distinguishable. Fresh and weathered surfaces are light to dark grey and brown and are often iron stained. Minerals observed in thin section include plagioclase, quartz, chlorite, amphibole, biotite, muscovite, epidote, and occasionally very minor garnet, tourmaline, opaque minerals and sphene (Photo 2). The proportion of mafic minerals varies considerably between samples. Plagioclase crystals are often partly or completely altered to saussurite.

CONGLOMERATE

Conglomerate is abundant close to the outer edges of the metavolcanic-metasedimentary complex. Conglomerate contains granule to pebble and cobble sized clasts. The most frequently observed clast types include: white to brown or pink feldspar crystals up to 3 mm in size, lithic clasts of granule conglomerate which contain feldspar crystal clasts, and light to medium-green or grey "granitic" medium-grained equigranular lithic clasts. Metasediments containing feldspar crystal clasts are transitional in colour and texture to the felsic to intermediate feldspar porphyry and quartz-feldspar porphyry and the felsic crystal tuff. These metasediments are common in beds which are as much



OGS 10 554

Photo 2–Photomicrograph in plane light of sphene (dark grains) in the fine grained matrix of a granule conglomerate found under the Ontario Hydro power line just north of Toll Creek.

as 1 m thick and which are close to and within the contact zone with the gneissose rocks; and in thicker beds and as clasts in conglomerates close to the southeastern edge of the metavolcanic-metasedimentary complex.

Less common clasts include quartz pebbles up to 5 cm in size, which are found mainly at the southeastern edge of the complex, and clasts of light to dark green metavolcanics. Some parts of the magnetite ironstone and chert have been brecciated by unknown processes to form granule to cobble conglomerate.

In each conglomerate, the matrix is similar in colour, texture, and mineralogy to fine-grained clastics found elsewhere in the complex. Colours range from light to dark green, grey, grey-green, grey-brown, brown-green, and rarely, pink-green. Weathered surfaces are light to dark green, grey, brown, and pink. Examination of thin sections of these rocks reveals that the clasts are composed of well rounded, broken crystals of feldspar and quartz, and assemblages of plagioclase-chlorite-amphibole, polycrystalline quartz with and without magnetite, and plagioclase-epidote-quartz-chlorite-amphibole-sphene (Photo 3). The content of mafics in each assemblage varies considerably. Plagioclase and amphibole crystals are generally partly or completely altered to saussurite and chlorite respectively.

OGS 10555

Photo 3–Photomicrograph in plane light of sphene (dark grains) in a lithic clast composed of quartz and epidote from a granule conglomerate, the same sample as shown in Photo 2.

Chemical Metasediments

MAGNETITE IRONSTONE, CHERT

Chemical metasediments, including magnetite ironstone and chert, are not common within the map area. Chert occurs in thinly laminated (0.3 cm) to thickly bedded (30 to 100 cm) layers interbedded with thinly laminated magnetite ironstone and thinly laminated to massive clastic metasediments and metavolcanics. The thickest unit of interbedded ironstone and chert observed is about 3 m thick with a total magnetite content of probably less than 1 percent. Individual, thin layers of ironstone contain up to 40 percent magnetite. Some of the magnetite ironstone has been brecciated by unknown processes to form granule to cobble conglomerate.

Possibly, the largest occurrence of magnetite ironstone within the map area is associated with one of two prominent magnetic highs (Ontario Department of Mines - Geological Survey of Canada 1963b) near Lake B (Lizard Lake). The lateral extent of the magnetite-bearing formation shown on Map

2490, back pocket is about the size of the formation shown on the maps by Algoma Ore Properties Limited (File SSM 673, Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie).

Fresh and weathered specimens of chert are white to light grey; specimens containing magnetite are black. Thin sections of samples of interbedded chert and magnetite contain quartz, magnetite, and minor amounts of chlorite, biotite and epidote.

FELSIC TO INTERMEDIATE INTRUSIVE AND METAMORPHIC ROCKS

FELDSPAR PORPHYRY, QUARTZ-FELDSPAR PORPHYRY

Dikes and sills of feldspar porphyry and quartz-feldspar porphyry occur throughout the map area. These rocks cut mafic to intermediate metavolcanics, and clastic and chemical metasediments. Southeast of the map area, these dikes and sills also cut the felsic to intermediate intrusive rocks (*see* section on "Synthesis and Geological History"). The dikes and sills range in width up to 3 m, average 1 m in width, and are of unknown strike length. Fresh and weathered surfaces are medium to dark grey and pink-grey. Thin section examination reveals that these rocks consist of plagioclase, quartz, chlorite, amphibole, and minor epidote and opaque minerals. The mafic content is usually less than 5 percent, and chemical analyses of two samples, one from outside the map area, plot as calc-alkalic rhyolites (Figures 2a and 2b, Table 2). Plagioclase and hornblende crystals are partly or completely replaced by saussurite and chlorite respectively.

GNEISSOSE TO METATEXITIC QUARTZ-FELDSPAR ROCKS

Along the northern boundary of the metavolcanics and metasediments are gneissose to metatexitic biotite-quartz-feldspar and less common chlorite-amphibole-quartz-feldspar rocks. These rocks are compositionally banded, and display variations in biotite, chlorite or amphibole content. No clear-cut contact exists between the gneissose rocks and the metavolcanic-metasedimentary complex. Instead, in a zone up to perhaps 50 m wide, rock types between the relatively clean quartz-feldspar gneissose rocks and the first obvious mafic to intermediate metavolcanic and metasedimentary rock are not always easily assigned to one grouping or the other. Within this zone, are found gneissose rocks with an above average mafic content and intimately interbedded felsic to mafic metasediments and metavolcanics. The gneissose rocks are interfingered with the metavolcanics and metasediments on a somewhat broader scale south of the Montreal River at the western edge of the map area and north of the Cow River just east of the landing of the Sheppard and Morse road in Moen Township. The impression gained by the author during field observations was that the gneissose rock is not of igneous origin nor do the contact zones demonstrate intrusive relationships (*see* section on "Synthesis and Geological History").

The gneissose rocks might thus be described as thickly laminated (0.3 to 1 cm) to thickly bedded (3 m) metasediments. Although the mafic content of these rocks averages from 1 to 5 percent, occasional chlorite-amphibole layers contain up to 50 percent mafic minerals. Metatexis, or partial melting (Mehnert 1971), has resulted in the remobilization of a small proportion of the gneissose rocks. Quartz-feldspar mobilizate may be observed as irregular narrow patches and stringers to larger dikes and sills within the gneissose rocks (*see* section on "Quartz-Feldspar Intrusive Rocks"). Fresh and weathered surfaces of the gneissose and metatexitic rocks are white to grey and pink-grey. Thin sections show the gneissose rock to be composed of plagioclase, chlorite, amphibole, biotite and minor epidote, quartz, opaque minerals and sphene. The quartz content averages less than 1 percent but is as much as 15 percent in one specimen, a rock which also contains 1 percent alkalic feldspar. Feldspar and amphibole crystals are generally altered to saussurite and chlorite respectively.

QUARTZ-FELDSPAR INTRUSIVE ROCKS

Felsic to intermediate intrusive rocks within the map area consist of the following:

1. mobilizate from the gneissose rocks
2. fine-grained to pegmatitic, commonly porphyritic dikes and sills intruding rocks close to and on both sides of the outer boundary of the metavolcanic-metasedimentary complex
3. a small stock intruding the complex just southeast of Troy Lake (the Troy Lake Stock)
4. a large pluton bordering the complex to the southeast

The large body southeast of the complex is massive and weakly foliated parallel to the contact with the metavolcanics and metasediments. Occasional traces of layering, however, may be found which resemble the gneissose rocks to the north. These traces are discontinuous and appear to have been almost completely obliterated. Close to the contact with the complex, a wide variety of apparently metavolcanic, metasedimentary and granitic xenoliths are common. Along the Ontario Hydro power line, these xenoliths include readily recognizable fragments of pillowed mafic flows. The contact between the body and the metavolcanic-metasedimentary complex was not observed by the field party. Fresh and weathered specimens of this intrusive are white to grey and pink-grey. Their mineralogy, as observed by the author in thin sections, comprises; plagioclase, quartz, chlorite, amphibole and minor epidote, opaque minerals, and sphene. One sample contained minor alkali feldspar. The quartz content varies from 25 percent to 30 percent, and the mafic mineral content can be as much as 5 percent. This pluton is a tonalite (see Strecheisen 1975). Amphibole and plagioclase crystals are mostly altered in part or are completely altered to chlorite and saussurite respectively.

The Troy Lake Stock is similar to the body exposed southeast of the metavolcanics and metasediments except that only a few small xenoliths, all probably granitic, were seen in the stock. The stock has a marginal zone of unknown width which is darker than the rest of it. The contact with the surrounding me-

tavolcanics and metasediments was not observed. Fresh and weathered specimens of the stock are white to grey and pink-grey except close to the outer edge where the rocks are, at least in part, medium to dark grey-green. Thin sections show the presence of plagioclase, quartz, chlorite, amphibole, and minor amounts of alkali feldspar, epidote, opaque minerals and sphene. In four thin sections out of five examined, the plagioclase, quartz, chlorite, and amphibole all occur in two distinct size fractions, one larger than the other by a factor of 10. Plagioclase and amphibole are partly to completely replaced by saussurite and chlorite respectively. The mineral composition is 15 percent to 25 percent quartz, up to but generally much less than 5 percent alkali feldspar and up to 70 percent mafic minerals. This stock is therefore a quartz diorite to tonalite (Streckeisen 1976).

Dikes and sills of quartz-feldspar intrusive rocks are as much as 20 m wide, but average 1 m in width. These rocks intrude the metavolcanic-metasedimentary complex, the gneissose rocks to the north, the Troy Lake Stock, and the plutonic rocks to the southeast of the map area. Grain sizes in these rocks range from less than 1 mm to greater than 5 mm, and many of the rocks are porphyritic with feldspar phenocrysts up to 1.5 cm in size. The metatexitic mobilizate found within the gneissose rocks is similar to, and for the most part is difficult to distinguish from quartz-feldspar dikes and sills found at the southeastern edge of the map area. Fresh and weathered specimens are light to medium grey and pink. Examination of hand specimens and one thin section reveals the presence of plagioclase, quartz, alkali feldspar, and minor amounts of muscovite and epidote. With up to 30 percent quartz, up to 10 percent alkali feldspar, and little or no mafics, these dikes and sills are tonalites to granodiorites (Streckeisen 1976).

Middle to Late Precambrian (Proterozoic)

MAFIC INTRUSIVE ROCKS

DIABASE, PORPHYRITIC DIABASE, OLIVINE DIABASE

Diabase and pophyritic diabase dikes and sills average only a few centimetres to at least 26 m in width, and cross-cut all of the above lithologies. The dominant trend of the dikes is N30°W with local variations from N10°W to N50°W. These trends change direction to an average trend of N45°W close to the power line. A secondary trend, almost at right-angles to the first, is N55°E. Diabase dikes have been interpreted on the map-face to reflect these trends (see Map 2490, back pocket). Many small dikes were not mapped separately from their host rock because of the scale of mapping. The pattern shown on Map 2490, back pocket, is thus schematic, and is not intended to represent the actual location or extent of individual dikes. Fine-grained chill margins are black and show diabasic textures in hand specimens, but fine- to medium-grained dike cores are dark green and equigranular. Weathered surfaces are dark

green and black, often with a distinct orange tint. Phenocrysts of feldspar, ranging in size up to 3 cm, are in a few places partly hollow resulting in matrix-filled hollow cross-sections and swallow-tail terminations on longitudinal sections. Minerals recorded during the examination of thin sections include: plagioclase, clinopyroxene, hornblende, chlorite, opaque minerals and minor amounts of quartz. The pyroxene is partly to completely altered to hornblende and chlorite. Feldspar crystals are less altered than in the metavolcanics and metasediments, and are partly to completely altered to saussurite. Where original textures can be observed, plagioclase is commonly twinned and zoned, and the anorthite content is greater than 50 percent.

Three outcrops of olivine diabase, possibly part of a sill, were found on the south shore of Lake A (Pillow Lake). This sill, a few metres in width, is medium grey to black on fresh surfaces and medium grey on weathered surfaces. Examination of thin sections reveals the presence of plagioclase, olivine, clinopyroxene and minor amounts of biotite, chlorite, epidote and opaque minerals. The clinopyroxene, titaniferous augite, is unaltered, but the olivine is partly altered and rimmed by green minerals which are possibly a mixture of chlorite and tremolite. Feldspar crystals are partly altered, much less than in any other rock within the map area, and are commonly twinned and zoned with an anorthite content of greater than 50 percent.

CLASTIC DIKE

Probably the youngest rock within the map area is a 1 cm to 6 cm thick clastic dike filling a fracture in the metavolcanics on the north side of the Cow River just east of the border between McParland and Moen Townships. This rock is a granule to pebble conglomerate with randomly-oriented compositionally banded fragments up to 2 cm in size. The matrix, as observed in thin section, contains variable proportions of quartz, carbonate, chlorite, epidote, and plagioclase, and is somewhat stained by iron oxide. All of the clasts appear to be similar to the gneissose rocks, containing plagioclase, quartz, chlorite and minor epidote, opaque minerals and sphene. The age of this rock is unknown, but it could be related to the Huronian conglomerates found by Grunsky (1979b) in the Cowie Lake area 30 km to the southwest.

Cenozoic

QUATERNARY

Pleistocene and Recent

Glacial ice last covered the map area during the Valders advance at 11 800 years BP. and deglaciation took place between 10 100 and 9 500 years BP. This last event was concurrent to the transition from the last post-Main Algonquin

Lake to the Lake Minong stage in the eastern Lake Superior basin (Saarnisto 1974). As a result of the glaciation, bedrock within the map area is covered with a discontinuous layer of unconsolidated sediments. The depth of overburden recorded in diamond-drill logs in the area is as much as 13 m. This suggests, as does the presence of abundant small bedrock outcrops, that the Pleistocene cover is relatively thin.

The dominant sediment type is sand to boulder till deposited as ground moraine with overlying smaller areas of glaciofluvial outwash comprising gravel, sand, silt and clay (McQuay 1979; Roed and Hallett 1979). As observed close to the Cow River, the outwash deposits consist mainly of sand forming a structureless, relatively flat plain. McQuay's map does not match the map of Roed and Hallett in McParland and Running Townships; McQuay's map shows a dominance of bedrock knobs with lesser ground moraine and the latter map shows the reverse. The unmapped transition from a dominance of bedrock outcrop to a dominance of ground moraine corresponds to an eastward diminution of topographic relief close to the western edge of the Rotunda Lake-Percy Lake map area.

Recent deposits consist mainly of organic material which accumulated in swamps and peat flats and some detrital material deposited in lakes and stream beds.

STRUCTURAL GEOLOGY

Rocks within the metavolcanic-metasedimentary complex are weakly to very strongly foliated, but the surrounding intrusive and metamorphic rocks are weakly to moderately foliated. In the southwest corner of the map area, the foliation does not always parallel presumed bedding surfaces, however, foliation and bedding do appear to be roughly parallel elsewhere. The foliation and banding in the gneissose to metatexitic rocks parallel foliation and bedding in adjacent metavolcanics and metasediments. Foliation patterns indicate a flattening perpendicular to what is now a north-south compressional axis throughout the map area. The deformation of pillows and the presence of mineral lineations show a vertical to near vertical elongation, which is probably greater in magnitude than the flattening.

Top determinations, most of them from pillow shape and packing, face northward except in the southwest corner of the map area where they face westward and southwestward. South facing top determinations found by Grunsky (1979a) to the west of the area lie close to the northern boundary of Grunsky's map. A synclinal axis proposed by Grunsky was extended into the map area and passes just north of the north-facing tops. Stratigraphic data, most notably the proportion and nature of clastic rocks found close to the northern and southeastern borders of the map area, are consistent with such a syncline. An anticlinal axis, about which the rocks in the southwest corner of the map area maybe folded, must run parallel to the synclinal axis somewhere close to the southern boundary of the map area.

Although minor folds and faults, kink bands, and mineral and fold lineations are common throughout the map area, there does not appear to be any

consistent pattern in their sense or distribution, as would be expected from the presence of a major fold axis nearby. Evidence for faults with offsets of more than a few centimetres was not observed; however, faults of unknown displacement could be present parallel to foliation or bedding surfaces. Large-scale photo-lineations, other than those which parallel known lithologies, were not found.

SYNTHESIS AND GEOLOGICAL HISTORY

The gneissose rock does not appear to be an igneous rock nor do the contact zones with the metavolcanic-metasedimentary complex demonstrate intrusive relationships. The author proposes, therefore, that the gneissose rocks are metasediments which are conformable with, and interbedded with, the lowermost units of the complex. The mineralogy of these rocks comprises plagioclase, quartz, chlorite, amphibole, and sphene. These rocks could have been derived from a mixed plutonic and metavolcanic terrain. In the unmapped region just to the north of the map area, the gneissose rocks outcropping along the Sheppard and Morse road towards Chapleau and along the power line road towards Wawa were observed to include occasional mafic, possibly metavolcanic layers. Sphene-bearing plutonic rocks border the complex to the southeast and are not uncommon elsewhere within the Superior Province.

Some samples of mafic to intermediate tuffs and metasediments contain detrital sphene and samples of conglomerates contain detrital sphene in the matrix and quartz-feldspar-epidote-sphene clasts. At the eastern end of the map area, a sphene-bearing granule conglomerate was found close to the junction of the Batchawana River and Percy Creek, a distance of 2.7 km from the contact with the plutonic rocks to the southeast. These occurrences suggest that at least part of the clastic rocks found within the metavolcanic-metasedimentary complex, especially towards the eastern end of the map area, were derived from two contemporaneous sources, one volcanic and the other plutonic. A volcanic source west of the map area is suggested by: the decrease in the proportion of mafic flows towards the eastern end of the map area; the location of the bulk of the felsic metavolcanics at the western edge of the map area; and the lack of geologic features normally associated with proximity to a vent.

Approximate stratigraphic thicknesses measured north and south of the synclinal axis just east of Troy Lake are 3 km and 7 km respectively. In Running Township, the metavolcanics and metasediments turn southward then southeastward about an anticlinal axis, joining rocks mapped by Siragusa (1976, 1978a, 1978b) and by Grunsky (1979b). On the maps accompanying these reports, the rocks face southwestward and the approximate stratigraphic thickness measures 16 km. Although the dip and degree of deformation of rock strata have not been taken into account, these data suggest that the original stratigraphic section thickened towards the south. The source of plutonic detritus which was contemporaneous with volcanic deposition, might thus have lain outside of the map area to the north.

One of the two samples of felsic to intermediate feldspar porphyry analyzed (*see* Figures 2a and 2b and Table 2) came from a point 2 km outside the map

area at the junction of the Batchewana River and the power line road. The porphyry, here cutting the pluton bordering the metavolcanic-metasedimentary complex, is macroscopically, microscopically, and chemically similar to feldspar porphyry dikes found within the complex. It is possible then, that these two samples come from the same source. The macroscopic, microscopic, and chemical similarities between the feldspar porphyry, the felsic metavolcanics, and the feldspar crystal-bearing granule conglomerates suggest that the sources of these rocks, but not their origins, may all be the same. Such a source could have been the dominantly felsic sedimentary and granitic terrain, which is represented by the gneissose and granitic rocks. The wide distribution of narrow dikes and sills of feldspar porphyry indicate that these rocks must have been very hot in order to penetrate throughout the metavolcanic-metasedimentary complex without solidifying. The source of the porphyry was located, therefore, at a site deep beneath the volcanic edifice, and possibly consisted of magma generated by the remelting of the underlying granitic terrain. The porphyry cuts all of the mafic and mafic to intermediate rock types, suggesting that it may be contemporaneous with, and in fact comagmatic with the felsic tuff and crystal tuff.

The granitic rocks exposed southeast of the metavolcanic-metasedimentary complex include occasional traces of layering which resemble the gneissose rocks to the north. This layering is best preserved 5 km southeast of the map area along the power line road in Scriven Township. Outcrops observed there are close to the top of the complex mapped by Keevil (1936) and depicted by Giblin and Leahy (1977). The traces of layering suggest that these rocks could also have been in part sediments derived from plutonic and volcanic rocks analogous to the gneissose rocks to the north.

The Troy Lake Stock has a dark phase at its edges, and is partly equigranular and is partly composed of minerals in two distinct size fractions. The dark marginal phase could be explained by contamination of the stock by the absorption of mafic rocks from the metavolcanic-metasedimentary pile. The bi-modal grain-size distribution could have resulted from cataclasis, that is, brittle failure of the mineral grains during intrusion of the stock. The first process is unlikely because of the very high temperatures and large amount of heat required to absorb significant volumes of wall-rock. The second process seems unlikely because of the lack of other cataclastic features in the stock, and because of the very low temperatures required for brittle failure. Instead, these features of the stock may be explained simply by assuming it to be similar to other granitic rocks within the map area. The dark marginal zone would have been a contact zone similar to the one between the metavolcanic-metasedimentary complex and the gneissose rock to the north. More significantly, the bi-modal grain size distribution is identical to textures seen in the clastics, especially the feldspar crystal and quartz-clast-granule conglomerates commonly found close to the edge of the complex.

The gneissose rocks, the Troy Lake Stock, and the granitic rock to the southeast appear to have been sedimentary rocks buried by the growing metavolcanic-sedimentary pile. As these rocks were buried, and isotherms within the earth roughly maintained their depth, the early sediments were heated. This resulted in the remobilization and concentration of their low-melting fraction, most notably potassium-rich alkali feldspar. The end products of the heat-

ing may presently be seen close to the edges of the metavolcanic-metasedimentary complex as:

1. a metatexitic melt in the gneissose rock
2. gneissosity in the metavolcanics and metasediments
3. quartz-feldspar, commonly porphyritic, and occasionally potassic dikes and sills cutting all rock types except the diabase

The quartz-feldspar dikes and sills were probably not super-heated to any great extent, and have intruded the complex for only a very short distance. The Troy Lake and the southeastern granitic rocks were relatively deeply buried; this led to the production of a larger proportion of melt, and, thus, a poorer preservation of layering than is found in the gneissose rocks to the north.

The sequence of events proposed by the author for the Rotunda Lake-Percy Lake map area began with the deposition of felsic to not commonly mafic sediments, presently represented by the gneissose rocks. Their source was possibly a mixed plutonic and volcanic terrain to the north. With the inception of volcanism to the west, incoming mafic clasts and minor, thin mafic flows were mixed with detritus from the north. As the volcanic edifice grew, however, the proportion of plutonic clasts declined. A thick succession of mafic flows interbedded with minor felsic and mafic to intermediate clastics and chemical metasediments (mainly magnetite ironstone) were deposited in the map area. The source area for the metavolcanics and metasediments is west of the map area. Therefore, a facies change occurs in the area from dominantly flows in the west to dominantly clastics in the east.

A late-stage outpouring of felsic volcanics west of the map area barely reached into the map area. Contemporaneous, subvolcanic felsic to intermediate intrusions of feldspar porphyry cut the mafic to intermediate volcanics and clastics and the granitic rocks. Quartz-feldspar dikes and sills, a product of localized remelting close to the bottom of the volcanic-sedimentary pile, intruded all of the rocks on both sides of the contact.

The loading of what may have been a relatively thin lithosphere resulted in subsidence which was likely, at least at the later stages, to have been contemporaneous with deposition. All of the rocks were folded about a synclinal axis passing roughly through the centre of the map area; an anticlinal axis occurs somewhat close to the southwestern border of the map area. As the metavolcanic-metasedimentary pile was folded downward, the Troy Lake Stock and the southeastern pluton rose upward. The last Precambrian events involved the intrusion of the diabase dikes, and, probably slightly later, the olivine diabase dikes.

ECONOMIC GEOLOGY

Summary of Occurrences

Surface exposures of mineralization observed during the 1979 field season are limited, being restricted to a single small vein of specular hematite, a few small showings of magnetite ironstone, and ubiquitous but insignificant pyrite

and minor pyrrhotite.

The hematite vein, located 0.3 km southeast of Lake A (Pillow Lake) in Schembri Township, is associated with quartz in a fracture which varies in width from about 1 cm to 8 cm over a distance of at least 3 m. The vein cuts massive, but possibly, pillowed, mafic flows. The vein appears to be hydrothermal in origin, given the association with quartz, and it may have been emplaced during remobilization of the plutonic rocks which outcrop 0.5 km to the south of the hematite vein.

Chemically deposited magnetite ironstone and chert were found in a few locations, mostly near Lake B (Lizard Lake) in Schembri Township. Occurrences observed probably contain less than 1 percent magnetite in up to 3 m thick sections of interbedded banded magnetite ironstone and chert. Individual, thin layers of ironstone contain up to 40 percent magnetite. Some of the magnetite ironstone has been brecciated by unknown processes to form granule to cobble conglomerate.

Disseminated pyrite and occasionally pyrrhotite are found in all rock-types within the map area. No other sulphide minerals were observed during the 1979 field season.

DESCRIPTION OF PROPERTIES AND OCCURRENCES

Current and defunct properties, for which geological or related information is available in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie, are listed in this report. Properties are located on the map-face by numbers corresponding with those with each company name. The numbers indicate the approximate centres of claim groups, or for larger blocks, the approximate area covered. Locations of diamond-drill holes are only approximate.

Algoma Central Railway [1962] (1)

The Algoma Central Railway (ACR) owns, and controls staking and exploration activity in Running and McParland Townships. As of December 31, 1979, Running Township was open, but McParland Township was closed to staking and exploration. These two townships are interpreted by the author to be underlain by virtually all of the rock-types shown on the map-face. These townships contain the bulk of the felsic metavolcanics.

Exploration by the ACR in Running Township has included several days work on property owned by the Rochefort Mining Syndicate [1930] (7) in 1960 and three ground traverses conducted in 1962. Trenches on the property of the Rochefort Mining Syndicate [1930] (7) were cleaned out and samples were taken, but assays showed only disappointing amounts of gold, silver, copper, and nickel. ACR concluded that no further work should be done on the Rocheford claim group.

Nine ground traverses were conducted by the ACR in McParland Township in 1961 and 1962, and no significant results reported.

Algoma Ore Properties Limited [1965] (2)

In 1963, Algoma Ore Properties Limited (a division of Algoma Steel Corporation Limited) staked eleven claims on three anomalies in Schembri, Moen, and Moggy Townships. Incomplete records show the claim groups at Lake B (Lizard Lake) and 1.5 km northeast of Lake B (Lizard Lake) to be numbered SSM 67736 to SSM 67739 inclusive, and SSM 67729 to SSM 67731 inclusive respectively. The third anomaly lies about 3 km north-northeast of Lake B (Lizard Lake) on the border of Moen and Moggy Townships.

Early investigations of these anomalies consisted of an airborne magnetometer survey flown over Lake B (Lizard Lake) in 1955, and ground magnetic, electromagnetic, and geological surveys run on the anomaly northeast of Lake B (Lizard Lake) in 1962. In 1964, all three anomalies were examined using ground magnetic, geological, and water geochemical surveys. The anomaly in Moen and Moggy Townships, interpreted in this report to be underlain by intermediate to mafic metavolcanics and diabase, was found to be caused by a small banded ironstone. The anomaly northeast of Lake B (Lizard Lake), interpreted in this report to be underlain by intermediate to mafic metavolcanics, minor metasediments, and diabase was discovered to result from a diabase dike containing about 10 percent magnetite. Also found at this anomaly was disseminated pyrite occurring intermittently across 61 m of metavolcanics. One sample of sulphide minerals is reported to have assayed at 0.3 percent copper with traces of silver and gold (Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie). No claims are presently held over either of these anomalies.

At Lake B (Lizard Lake) the anomaly was thought to be caused by magnetite-ironstone and chert in a main zone varying in width from 7 to 26 m and in smaller bands, 1 to 8 m wide, leading off the main zone on the north side. The area immediately south of Lake B (Lizard Lake), interpreted here to be underlain by intermediate to mafic metavolcanics, metasediments and diabase, is shown on geological maps submitted by the company to be underlain by metavolcanics, clastic and chemical metasediments, diabase, diorite, and quartz-feldspar porphyry. The ironstone, interbedded in part with clastic metasediments, was estimated to contain less than 3.7×10^6 kg per vertical metre (12 000 tons per vertical foot) of unknown grade, with an average width of 18 m over a length of 61 m (Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie). To further test the occurrence, four diamond-drill holes totalling 125 m in length were collared in claim number SSM 67736 in 1965. The holes cut several intersections of from less than 1 to 16 m of magnetite ironstone.

No more recent work has been reported, and claims numbered SSM 67738 and SSM 67739 have been allowed to lapse. The other two claims shown on the map-face, SSM 67736 and SSM 67737, are leased by the Algoma Steel Corporation Limited.

Asarco Exploration Company of Canada Limited [1974] (3)

A total of 145 claims in six groups were staked by Asarco Exploration Company of Canada Limited in 1973. The largest group, comprising 70 contiguous claims numbered SSM 373823 to SSM 373872 inclusive and SSM 373925 to SSM 373944 inclusive, lies within Moen Township between Caesar Lake and the border of McParland Township. A group of 15 contiguous claims, numbered SSM 373945 to SSM 373954 inclusive and SSM 373893 to SSM 373897 inclusive, was located just south of the largest group within Moen Township. Two small groups, one of nine contiguous claims numbered SSM 360323 to SSM 360331 inclusive and one of four contiguous claims numbered SSM 360176 to SSM 360179 inclusive, were located in Schembri Township at the border with Running Township and in the northeast corner of Schembri Township respectively. The last two groups, consisted of 35 contiguous claims numbered SSM 373873 to SSM 373892 and SSM 373910 to SSM 373924 inclusive and 12 contiguous claims numbered SSM 373898 to SSM 373909 inclusive, extended from just inside Moen Township to about 1 km northeast of Percy Lake in Moggy Township. All of the claims are interpreted by the author to be underlain by intermediate to mafic metavolcanics, and minor amounts of felsic metavolcanics and metasediments, and diabase dikes.

Airborne magnetic and electromagnetic (vertical coil) surveys flown in 1973 indicated the presence of 12 conductors and two other anomalous zones. Follow-up work included the geological mapping of four anomalies and the diamond-drilling of four holes totalling 312 m in length, one at the western boundary of Schembri Township and three in Moen Township, located 0.5, 2.5 and 4.7 km respectively, west of Caesar Lake. These holes were diamond-drilled in 1974 on claims SSM 360327, SSM 373853, SSM 373826, and SSM 373940 respectively. All of the holes intersected only minor amounts of pyrite, pyrrhotite, and graphite and trace amounts of chalcopyrite. The diamond-drill hole 0.5 km west of Caesar Lake also intersected minor sphalerite. No further work has been reported, and all of the claims have been allowed to lapse.

Golden Ashley Explorations Limited [1966] (4)

In 1965, Golden Ashley Explorations Limited staked 18 contiguous claims in the southeast corner of Running Township. Of these claims, 14, numbered AC 7661 to AC 7674 inclusive, lay on land owned by the Algoma Central Railways and four numbered SSM 77357 to SSM 77360 inclusive, lay on land retained by the Crown and excluded from the land grant and transfer to the Railway in 1913. All of claims SSM 1206, AC 7661 and AC 7669, and part of claims SSM 1207, AC 7662 and AC 7670 lie within the Rotunda Lake-Percy Lake map area. A brief geological survey, conducted in the winter of 1966 by Golden Ashley Explorations Limited, found nothing other than very minor amounts of pyrite. The claims, interpreted by the author to be underlain by intermediate to mafic metavolcanics, metasediments and diabase, have been allowed to lapse.

Kerr Addison Gold Mines Limited [1959] (5)

In 1959, Kerr Addison Gold Mines Limited examined claim number AC 1400 of the Rochefort property (*see* section on "Rochefort Mining Syndicate [1930] (7)"). The claim is interpreted by the author to be underlain by mafic metavolcanics and diabase, and is part of a group of claims which covers a large quartz vein. A geological sketch map submitted by the company shows the locations of five trenches and two diamond-drill holes which totalled 64 m in length. No drill logs or other report data are available. No subsequent work has been reported by this company, and the claims were allowed to lapse.

Rio Canadian Exploration Limited [1956] (6)

In 1956, Rio Canadian Exploration Limited (formerly Technical Mine Consultants Limited) completed geological, airborne electromagnetic, ground gravity, and magnetic and silt and soil geochemical surveys in five townships owned by the Algoma Central Railway. The surveys covered that part of Running Township situated within the current map area. This part is interpreted by the author to be underlain by most of the lithologies present within the map area including the bulk of the felsic metavolcanics. Only a few anomalous zones were found within the map area by the surveys carried out. None appear to have been studied to any extent, likely due to a lack of economic potential. No follow-up work was even reported, and exploration rights to the township were open at the end of 1979.

Rochefort Mining Syndicate [1930] (7)

In 1926 the Rochefort Mining Syndicate held eight contiguous claims on Quinn River (then known as Snake Creek) in Running Township. Three of them, numbered AC 1318, AC 1400, and AC 1401 were patented and five of them, numbered AC 3493 to AC 3497 inclusive were not. Only AC 1400 and parts of AC 3493 and AC 3495 lie within the map area. These claims, interpreted by the author to be underlain by mostly mafic metavolcanics and diabase, followed a quartz vein for well over 1 km. Mineralization recorded included only insignificant amounts of pyrite, pyrrhotite, and chalcopyrite along with gold assays as high as five dollars per ton (Resident Geologist's Office, Ontario Ministry of Natural Resources, Sault Ste. Marie; 1926 gold price was $20.67 per ounce of gold). No further work was reported by the company, and the claims were allowed to lapse.

Sutherland Occurrence (8)

Sutherland and Associates held in 1965, a group of 30 contiguous claims near Lake A (Pillow Lake) in Schembri Township. The claims, numbered SSM

71542 to SSM 71553 inclusive and SSM 71680 to SSM 71697 inclusive, are interpreted here by the author to be underlain by mafic metavolcanics, metasediments, granitic rocks and diabase. Records of work on file consist of logs for 13 diamond-drill holes totalling 1249 m in length collared in 1965. These holes intersected only insignificant amounts of pyrite, pyrrhotite, magnetite, hematite, sphalerite and galena, and possibly a few specks of silver and molybdenite (Resident Geologist's Files, Ontario Ministry of Natural Resources, Sault Ste. Marie). No other work has been reported and the claims were allowed to lapse.

Suggestions for Further Exploration

Syngenetic, strata-bound deposits which have been discovered in the map area are limited to the deposits of magnetite ironstone. The bulk of these deposits lie close to Lake B (Lizard Lake). Other environments conducive to known base metal or precious metal economic mineralization were not observed. Indications of massive sulphide-type deposits have so far not been discovered. Given the small volume of felsic metavolcanics present in the area, the probability of finding any deposits seems low. The amount of disseminated sulphide minerals present in the metavolcanics and metasediments apparently decreases towards the north; the gneissose rocks are essentially barren of sulphide minerals. Exploration for massive sulphide-type deposits associated with the intermediate to mafic metavolcanics might best be restricted to the area south of the synclinal axis shown on Map 2490 (in back pocket).

The author observed no evidence for volcanogenic hydrothermal alteration, that is localized silicification, chloritization, or sericitization. This is probably due to the area being distal from volcanic centres. As indicated by the presence of the hematite-quartz vein, however, it is possible that minerals could have been concentrated by remobilization and redeposition in low-temperature veins close to the granitic rocks to the southeast. The granitic rocks themselves, including the pegmatites, appear to be barren of any economic mineralization. Exploration for hydrothermal-type deposits should be restricted to the metavolcanics and metasediments close to these granitic rocks, and possibly the area immediately surrounding the Troy Lake Stock.

Structural traps such as folds and faults do not appear to have concentrated any minerals. Uranium reported by Grunsky (1979b) just to the west of the map area is associated with the Montreal River Fault which passes to the north of the map area. Given that the Montreal River Fault is an extension of the Kapuskasing 'High' which might be inferred from the work by Grunsky (1979a), then it may be expected that any mineralization associated with the Kapuskasing 'High' would possibly lie north of the map area.

Magnetite ironstone found within the map area has not generated a lot of interest, possibly because deposits to the south within the same belt are likely to contain much greater volumes of ironstone.

REFERENCES

Department of Energy, Mines, and Resources
1976: Grey Owl Lake; Topographic Map 41 N/8, scale 1:50 000.
1977: Bully Lake; Topographic Map 41 O/5, scale 1:50 000.

Giblin, P.E., and Leahy, E.J.
1977: Geological Compilation of the Batchawana Sheet, Districts of Algoma and Sudbury; Ontario Geological Survey, Preliminary Map P.302 (1977 Revision), Geological Compilation Series, scale 1:126 720.

Grunsky, E.C.
1979a: Geology of the Grey Owl Lake Area, District of Algoma; Ontario Geological Survey, Open File Report 5274, 102p.
1979b: Cowie Lake; Ontario Geological Survey Map 2426, Precambrian Geology Series, scale 1 inch to ½ mile, Geology 1977.

Keevil, N.B.
1936: Cow River Area; Geological Survey of Canada, Map 366A, scale 1 inch to 2 miles, Geology 1936.

McQuay, D.F.
1979: Northern Ontario Engineering Geology Terrain Study, Data Base Map, Batchawana; Ontario Geological Survey, Map 5011, scale 1:100 000.

Mehnert, K.R.
1971: Migmatites and the Origin of Granitic Rocks; Elsevier Publishing Company, 405p.

Moore, E.S.
1925: Mississagi Reserve and Goulais River Iron Ranges, District of Algoma; Ontario Department of Mines, Annual Report, Volume 34, p. 1-32, includes Geological Map 34d, scale 1 inch to 1 mile, Geology 1924.

Ontario Department of Mines - Geological Survey of Canada
1963a: Hubert, Algoma District; Ontario Department of Mines-Geological Survey of Canada Aeromagnetic Map 2216G, scale 1 inch to 1 mile.
1963b: Cow River, Sudbury and Algoma Districts; Ontario Department of Mines-Geological Survey of Canada Aeromagnetic Map 2203G, scale 1 inch to 1 mile.

Roed, M.A., and Hallett, D.R.
1979: Northern Ontario Engineering Geology Terrain Study, Data Base Map, Wenebegon Lake; Ontario Geological Survey, Map 5016, Scale 1:100 000.

Saarnisto, M.
1974: The Deglaciation History of the Lake Superior Region and its Climatic Implications; Quaternary Research Volume 4, p.316-339.

Siragusa, G.M.
1976: Batchawana-Pangis Area (Eastern Half), District of Algoma; Ontario Division of Mines, Preliminary Map P.1193, Geological Series, scale 1:15 840 or 1 inch to ¼ mile. Geology 1975.
1978a: Quinn Lake Area (Western Half), District of Algoma; Ontario Geological Survey Preliminary Map P.1833, Geological Series, scale 1:15 840 or 1 inch to ¼ mile, Geology 1976.
1978b: Quinn Lake Area (Eastern Half), District of Algoma; Ontario Geological Survey Preliminary Map P.1834, Geological Series, scale 1:15 840 or 1 inch to ¼ mile, Geology 1976.

Streckeisen, A.
1976: To Each Plutonic Rock its Proper Name; Earth-Science Review, Volume 12, p.1-33.

Winkler, H.G.F.
1976: Petrogenesis of Metamorphic Rocks; Springer-Verlag, New York, 4th Edition, 334p.

INDEX

PAGE

Algoma Central Railway 3,4,24,26,27
Algoma Ore Properties Ltd. 4,16,25
Algoma Steel Corp. Ltd. 4,25
Analyses, chemical; table 7
See also: Assays.
Anomalies 25,26
Anticlinal axis. 20,23
Asarco Exploration Co. of Canada Ltd. 4,26
Assays. 24,25,27
See also: Analyses, chemical.

Basalt:
  Calc-alkalic. 9
  Tholeiitic. 9
  High-iron 9
  High-magnesium 9
Batchawana Greenstone Belt 4
Batchewana River 10,21,22

Caesar Lake 26
Calc-alkalic basalt:
  High-iron 9
  High-magnesium 9
Chalcopyrite. 26,27
Chemical analyses; table 7
See also: Assays.
Chert 15,16,24
Clastic dike:
  Clasts 19
  Possible age 19
Clasts:
  In clastic dike 19
  In conglomerate 14
Conglomerate, granule 13,21
  Clasts in. 14
  Matrix 14
Contacts:
  Discussion 8
  Metavolcanic-metasedimentary complex-gneissose rocks . . . 16,21
  Quartz-feldspar intrusive rocks-metavolcanic-metasedimentary complex. . . . 17
Copper 24,25
Cow River 11,16,19,20

Dacite, tholeiitic:
  High-iron and high-magnesium 9
Diabase 18
  Porphyritic. 18
  Olivine 19
Dikes:
  Clastic. 19
  Diabase 18

PAGE

  Feldspar porphyry 16,22
  Olivine diabase 23
  Porphyritic diabase 18
  Quartz-feldspar 23
  Quartz-feldspar porphyry 16

Feldspar phenocrysts 19
Feldspar porphyry dikes 16,22
Flows 10
Foliation 20

Galena. 28
Garnet. 11,13
Glaciation:
  Till, sand to boulder. 20
  Lake Algonquin 19
  Lake Minong 20
  Valders advance 19
Gneissose rocks:
  Contact with metavolcanic-metasedimentary complex. . 16,21
  Origin of 22
Gold 24,25,27
Golden Ashley Explorations Ltd. 4
Granitic rocks, layering in 22
Graphite 26
Greenstone Belt, Batchawana. 4

Hematite 28
  Specular, vein 23,24
Hematite-quartz vein 28

Ironstone. 15,25
  Magnetite. 15,23,24,28

Kerr Addison Gold Mines Ltd. 4

Lake A (Pillow Lake). 4,10,19,24,27
Lake Algonquin (glacial). 19
Lake B (Lizard Lake) 4,6,15,24,25,28
Lake Minong (glacial). 20
Lake Superior basin 20
Lithologic units; table 5

McParland Tp. 6,24,26
Magnetic highs 6
Magnetite. 24,25,28
Magnetite ironstone 23,24,28
Metasediments:
  Criteria for separation from metavolcanics 13
  Source area 23
Metatexis. 17
Metavolcanic-metasedimentary complex . . 4,6,9,12,13,20,22,23

PAGE

Contacts:
Gneissose rocks 16,21
Quartz-feldspar intrusive rocks 17
Metavolcanics source area 23
Mobilizate, quartz-feldspar 17
Moen Tp. 4,16,25,26
Moggy Tp. 4,25,26
Molecular norms; table 7
Molybdenite 28
Montreal River 11,16
Morse and Sheppard road 16,21

Nickel 24

Olivine 19
Olivine diabase 19
Dikes 23
Ontario Hydro power line 17
Overburden, depth of 20

Percy Creek 21,26
Pillows 10
Plutonic detritus, source of 21
Porphyry:
Feldspar 16
Quartz-feldspar 16
Power line, Ontario Hydro 17
Pyrite 23-28
Pyrrhotite 24,26-28

Quartz diorite 18
Quartz-feldspar dike 23
Quartz-feldspar intrusive rocks - metavolcanic - metasedimentary complex contact 17
Quartz-feldspar mobilizate 17
Quartz-feldspar porphyry 16
Quartz vein 27
Quinn River 4,27

Rio Canadian Exploration Ltd. 4
Rochefort Mining Syndicate 4,24
Running Tp. 4,12,24,26,27

Schembri Tp. 4,24-27
Scriven Tp. 22
Sheppard and Morse road 16,21
Sills 16,18,22,23
Silver 24,25,28
Snake Creek 27
Sphalerite 26,28
Sphene 21
Stratigraphic thickness 21
Sulphide minerals
See: Chalcopyrite; Galena; Molybdenite; Pyrite; Pyrrhotite; Sphalerite
Sutherland and Associates 4,27
Synclinal axis 20,23
Syngenetic, strata-bound deposits 28

Technical Mine Consultants 4,27
Tholeiitic basalt:
High-iron 9
High-magnesium 9
Tholeiitic dacite:
High-iron 9
High-magnesium 9
Till, sand to boulder 20
Tonalite 17,18
Top determinations 20
Tourmaline 12
Troy Lake 6,12,17,20,23
Troy Lake Stock 6,17,18,22,23,28

Uranium 28

Valders advance (glaciation) 19
Veins:
Hematite-quartz 28
Quartz 27
Specular hematite 23,24

MAPS NOT

FILMED

CARTES

OMISES

POOR

QUALITY

ORIGINAL